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09/812,553	03/21/2001	Yoshitaka Sasaki	108972	2633

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EXAMINER

CULBERT, ROBERTS P

ART UNIT PAPER NUMBER

1763

DATE MAILED: 04/28/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/812,553

Applicant(s)

SASAKI, YOSHITAKA

Examiner

Roberts Culbert

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 10 April 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☐ Claim(s) 2-4,6,8-41 and 43-50 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 2-4,6,8-41 and 43-50 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some \* c) ☐ None of:  
1. ☒ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

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## DETAILED ACTION

### *Allowable Subject Matter*

The indicated allowability of claims 25, 26, and 34-42 is withdrawn in view of the discovered prior art. Rejections based on the new prior art follow.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2-4, 6, 8-13, 20-25, 27-41, 43, and 47-50 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 4,791,719 to Kobayashi et al. in view of U.S. Patent 6,329,211 to Terunuma et al. and in further view of Japanese Patent 11-312303 to Sasaki

Terunuma teaches a method of manufacturing a thin film magnetic head including first and second magnetic layers (21) and (22) magnetically coupled to each other and having first and second magnetic poles (210) and (220) which face each other with a gap layer (24) in between near and in a recording medium-facing surface to be faced with a recording medium, a thin film coil portion (23) provided between the two magnetic layers, and an insulating layer (25) for insulating the thin film coil portion from the two magnetic layers, wherein at least one of a step of forming the first magnetic pole and a step of forming the second magnetic pole includes: a step of forming a magnetic material layer (220); a first etching step of forming a first mask having a narrower width by ion beam etching (Col. 3, Paragraph 2) and simultaneously, etching the magnetic material layer to a depth in an area other than an area where the first mask is formed; and a second etching step of forming at least one of the first and second magnetic poles by selectively etching the magnetic material layer by ion beam etching with the first mask. During the

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second etching step, at least the first magnetic pole in the first magnetic layer and the second magnetic pole in the second magnetic layer are formed. Also, an area in the gap layer other than an area where the first magnetic pole is formed is selectively removed by reactive ion etching. See Figure 16, and the corresponding description (Col. 9, Lines 54-59). The first mask is formed so that a plane shape thereof includes at least a portion corresponding to the first magnetic pole in the first magnetic layer portion. Teranuma also teaches that the formation of the first magnetic pole in the first magnetic layer, selective removal of the area in the gap layer other than the area where the first magnetic pole is formed, and formation of the second magnetic pole in the second magnetic layer are continuously performed in a series of steps (Col. 9, Lines 54-59). In the method of Teranuma the ion beam irradiation angle is changed from a first angle of 25-55 degrees to a second angle of 60-80 degrees (Col. 9, lines 1-7), the angle being defined as an angle between the direction of the ion beam and a direction orthogonal to an extending direction of the magnetic material layer. Terunuma does not show the use of a mask precursor layer in the formation and patterning of the magnetic layer and does not show reactive ion etching with the magnetic material layer.

Kobayashi does show the required patterning steps in the formation of a thin-film magnetic head. Referring to Fig. 7B, Kobayashi teaches a method of manufacturing a thin film magnetic head including first and second magnetic poles (3) and (7) which face each other with a gap layer (4) in between near and in a recording medium-facing surface to be faced with a recording medium, a thin film coil portion (5) provided between the two magnetic layers, and an insulating layer (6) for insulating the thin film coil portion from the two magnetic layers, wherein at least one of a step of forming the first magnetic pole and a step of forming the second magnetic pole includes: a step of forming a magnetic material layer (7). The magnetic material layer (7) is deposited by sputtering with a predetermined magnetic material (Col. 3, Lines 13-15). In the formation of the magnetic material layer, Terunuma shows the formation inside a photoresist frame (see Fig. 11) that leaves the magnetic layer patterned over the gap layer.

Referring to (Fig. 4-6), Kobayashi shows an alternative for the formation of the magnetic layer that includes forming a magnetic layer (7A), forming a metal oxide mask precursor pattern

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on the magnetic layer, and etching a part of the mask precursor pattern (9) by ion beam etching (Col. 3, Lines 45-45). The mask precursor layer is a predetermined inorganic material such as alumina or titania (Col. 3, Lines 26-27). Kobayashi further teaches etching the magnetic material layer to a depth in an area other than an area where the first mask is formed (Col. 3, Lines 60-62). Forming the mask precursor pattern includes a step of forming a mask precursor layer on the magnetic layer (See Fig. 4B), and a third etching step of forming the mask precursor pattern by selectively etching the mask precursor layer by reactive ion etching (Col. 3, Lines 32-41). A second photoresist or metal mask having a shape corresponding to a plane shape of the mask precursor pattern is used (Col. 3, Lines 55-60). Although it is not explicitly stated in the reference, it may be assumed that the photoresist or metal mask is patterned and etched in the desired shape, and the photoresist or metal film is removed during etching and patterning, as this step is notoriously old and well known in the art. Further, it is clear that if the photoresist or metal film was not removed in the well-known manner, the layer would be shown in Figure 5B of Kobayashi. However, Kobayashi does not show that the mask and magnetic layer are narrowed and does not show the simultaneous etching of the mask precursor layer and the magnetic layer.

It would have been obvious to one of ordinary skill in the art at the time of invention to narrow the width of the magnetic poles in Kobayashi using the ion milling technique disclosed in Terunuma in order to enable high-density recording. Further, it would have been obvious to etch the mask precursor layer and magnetic layer simultaneously. A person having ordinary skill in the art would have been motivated to combine etching steps in order to reduce production time and lower production costs.

Terunuma in view of Kobayashi does not teach the limitation of a first magnetic layer including a first magnetic layer portion having the first magnetic pole and a second magnetic layer portion formed separately and magnetically coupled to the first magnetic layer portion. The references do not show that the second magnetic layer portion is partially overlapped with a part of the first magnetic layer portion, and an end of the recording-medium-facing side of the of the second magnetic layer portion is positioned apart from the recording-medium-facing surface.

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Sasaki teaches the required limitations however, See figure 24 of JP 11-312303.

It would have been obvious to one of ordinary skill in the art at the time of invention to form a first magnetic layer including a first magnetic layer portion having the first magnetic pole and a second magnetic layer portion formed separately and magnetically coupled to the first magnetic layer portion where the second magnetic layer portion is partially overlapped with a part of the first magnetic layer portion, and an end of the recording-medium-facing side of the of the second magnetic layer portion is positioned apart from the recording-medium-facing surface in order to prevent the leakage flux from the end face of the yoke portion (second magnetic layer portion) from affecting the recording track. See Paragraph 42 of JP 11-312303.

Regarding the use of reactive ion etching with the magnetic layer, Kobayashi teaches the use of reactive ion etching for the mask precursor layer, and the magnetic layer (Col. 4, Lines 10-15). Kobayashi also comments that the type of etching used is selected primarily on the type of material used (Col. 3, Lines 25-40). In this case, alumina is used as the mask precursor and therefore reactive ion milling is appropriate. Teranuma teaches that etching may be performed using reactive ion etching as well as ion beam etching (Col. 3, Lines 19-21). It would have been obvious to one of ordinary skill in the art at the time of invention to use either reactive ion etching or ion beam etching or a combination (reactive ion milling) as suggested by Kobayashi as a matter of selection from the well-known etching methods in the art.

Regarding Claim 21, a layer deposited by chemical vapor deposition is an art-recognized equivalent method for forming a layer as sputtering is shown in Kobayashi. It would have been obvious to one of ordinary skill in the art at the time of invention to use one of the known methods to form the layer.

Regarding claim 22, it would have been obvious to one of ordinary skill in the art at the time of invention to deposit the layer under a pressure of 100 Pa or lower in order to reduce the etch time in the well-known manner.

Regarding claims 27, 28, 47, and 48, it would have been obvious to one of ordinary skill in the art at the time of invention to perform the etching in a gas atmosphere containing at least

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one of chlorine, boron trichloride, hydrogen chloride, carbon tetrafluoride, sulfur hexafluoride, and boron tribromide as well as a temperature in a range from 50 degree to 300 degrees. as these gasses and temperatures are widely known and used in the etching art for the purpose of dry etching selected areas of a magnetic head. Changes in temperature, concentrations, or other process conditions of an old process, do not impart patentability unless the recited changes are critical, i.e., they produce a new and unexpected result. *In re Aller et al.*, 105 USPQ 233.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S Patent 4,791,719 to Kobayashi et al. in view of U.S. Patent 6,32,211 to Terunuma et al. and in further view of U.S. Patent 6,183,656 to Ide et al.

Regarding claim 9, the step of polishing the surface of the magnetic material layer so as to planarize the surface thereof is well-known in the art as shown by the reference and would have been obvious to one of ordinary skill in the art at the time of invention. The required step is described in Ide et al. (Col. 4, Lines 37-45).

Claims 14-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S Patent 4,791,719 to Kobayashi et al. in view of U.S. Patent 6,32,211 to Terunuma et al. and in further view of U.S. Patent 6,303,392 to Matsukuma.

As applied above, Kobayashi and Terunuma disclose the method of the invention substantially as claimed but do not show the type of metal film used to mask the mask precursor layer. Kobayashi does teach that the metal mask may be a permalloy (Col. 3, Lines 45-50). Matsukuma teaches a method for forming such a permalloy mask including: nickel-iron, nickel-boron, nickel-phosphorus, copper, cobalt and other metals (Col. 6, Lines 10-13). It would have been obvious to one of ordinary skill in the art at the time of invention to use any of the alloys suggested by Matsukuma as a matter of selecting a permalloy from a list known in the art to be suitable for forming a mask. Selectively growing the film on a surface is considered analogous to plating as described in Matsukuma (Col. 6, Lines 13-15)

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Claims 44-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 4,791,719 to Kobayashi et al. in view of U.S. Patent 6,32,211 to Terunuma et al. and in further view of Japanese Patent 11-312303 to Sasaki and U.S. Patent 6,0726,671 to Gill.

Regarding claims 44-46, it would have been obvious to one of ordinary skill in the art at the time of invention to use iron nitride as the magnetic material or to use an amorphous alloy such as iron cobalt zirconium oxide since the materials are well-known for the purpose in the art as shown in JP 11-312303, paragraph 8, and Gill, claim 27.

Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 4,791,719 to Kobayashi et al. in view of U.S. Patent 6,32,211 to Terunuma et al. and in further view of Japanese Patent 11-312303 to Sasaki and U.S. Patent 6,130,805 to Sasaki.

As applied above, Kobayashi in view of Terunuma and Sasaki disclose the invention substantially as claimed, but do not teach the first magnetic layer further includes an expanded portion which is magnetically coupled to the first magnetic pole on the side far from the recording medium facing surface and is wider than the first magnetic pole, a step in the width is formed in a position where the first magnetic pole and the expanded portion are coupled to each other, and a corner is formed at a part where a side face of the first magnetic pole and a step face of the expanded portion in the step cross each other, the first mask is formed so that the plane shape thereof includes a part corresponding to a plane shape of the expanded portion, and an angle at a part corresponding to the corner of the first magnetic layer portion lies in a range from 90 degrees to 120 degrees.

The '805 patent to Sasaki teaches the limitation as claimed (Col. 16, Lines 45-60). Refer to Figure 45. It would have been obvious to one of ordinary skill in the art at the time of invention to form the expanded portion as shown by Sasaki in order to suppress an increase in the effective track width and improve the overwrite property as suggested. (Col. 16, Lines 60-63)

#### **Conclusion**



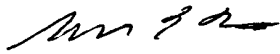
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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Roberts Culbert whose telephone number is (703) 305-7965. The examiner can normally be reached on Monday-Friday (7:30-4:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on (703) 308-1633. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

April 22, 2003

  
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